CEILING TILE

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TECHNICAL FIELD AND INDUSTRIAL APPLICABILITY OF THE INVENTION

This invention relates to suspended ceiling tiles which are fitted into a conventional ceiling grid system.

BACKGROUND OF THE INVENTION

U.S. 3,782,495 discloses a thin, lightweight suspended ceiling tile. The tile includes a wire frame over which a thin skin, i.e., aluminum foil or thin plastic film, is applied. The edges of the skin are wrapped around the wire frame and are secured by adhesive.

U.S. 6,499,262 illustrates a suspended ceiling structure including a rectangular grid and a plurality of panels supported on the grid. The panels are assemblies of a rigid perimeter frame, a fabric sheet, sound absorbing material, and sound transmission attenuating material. The fabric sheet forms the visible face of the panel when it is installed in the ceiling grid. The frame includes side members which are preferably formed as extrusions of thermoplastic material, such as polyvinyl chloride. Suitable materials for the fabric include polyester, polyolefin, vinyl-coated fabric or acrylic fabric.

U.S. 4,580,387 illustrates a corrosion resistant grid construction for suspended ceiling. A portion of two cross members are joined by a junction clip to either side of main members. The main and cross members are formed in an inverted T configuration. A flange extends from either side of a base web which support ceiling panels. Main and cross members also support the ceiling members.

U.S. 3,186,129 discloses a ceiling structure having a plurality of rectangular panels each having two layers of translucent polyvinyl chloride plastic material which are stretched over the upper and lower edges of a rectangular sheet metal frame. The panels are supported on a strip-metal gridwork having rectangular openings. The metal strips on the grid are of a T-shape to that the panels can be easily located on the horizontal surfaces.

U.S. 3,460,299 illustrates a suspended ceiling having a plurality of rectangular window openings, constructed of wood or metal, bounded by wood or metal flanges for receiving and supporting the edges of luminous ceiling panels. The ceiling panels are made of a translucent material which diffuses light such as flexible plastic films made of polyester, vinyl, acrylic, polyethylene, or terephthalate.

In the past, suspended ceilings have been constructed of wood or metal materials, which are heavy and high in cost. There is a need for an improved, low-cost, suspended ceiling panel system constructed of lightweight materials that permit easy installation while providing an aesthetically pleasing appearance.

SUMMARY OF THE INVENTION

These needs are met by the present invention, wherein an improved ceiling panel for a suspended is provided. The ceiling panel includes a main frame having at least two crossing members within said main frame. The ceiling panel is preferably constructed of injected molded plastic and is a one-piece design. A facing material, preferably a veil, fabric or textile, is adhered to the main frame and crossing members. The ceiling panel fits in a conventional suspended ceiling grid system and hides pipes, cables and unfinished ceilings.

It is an object of the present invention to provide a ceiling panel that is lightweight providing for easy handling and installation.

It is another object of the present invention to provide a ceiling panel for a suspended ceiling system that is low in cost without impacting aesthetics.

It is another object of the present invention to provide a ceiling panel that is easy to manufacture.

It is another object of the present invention to provide a ceiling panel that provides acoustical benefits to a suspended ceiling system.

Other objects and advantages of the present invention will become apparent upon considering the following detailed description and appended claims, and upon reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is plan view of the support frame for a ceiling panel of the present invention

Fig. 2 is a plan view of the ceiling panel of the present invention.

Fig. 3 is a side view of the ceiling panel of the present invention

Fig. 4 is a side view of another embodiment of the ceiling panel of the present invention.

DETAILED DESCRIPTION AND PREFERRED EMBODIMENTS OF THE INVENTION

The present invention is directed to a ceiling panel for use in a suspended ceiling system. The ceiling panel includes a main frame and at least two crossing members within said main frame. A facing material is adhered to the main frame and crossing members.

Referring now to Fig. 1, support frame 2 includes main frame 4 and crossing members 6 and 8. Crossing member supports 10 provide stability where crossing members 6 and 8 contact the frame 4. It is preferable for the support frame 2 to be a one-piece frame, however, frame 4 and crossing members 6 and 8

may be manufactured separately, assembled in two or more pieces and then welded together by a plastic or metal welding process.

Fig. 1 shows a square support frame, however, the support frame may be any shape suitable for use in a suspended ceiling system. For example, the support frame may be circular, rectangular, triangular, etc. Fig. 1 shows two crossing members 6 and 8. In certain instances, there may be more than two or several crossing members depending on the size of the ceiling panel. The crossing members are not limited to an "X" shape, as shown in Fig. 1. For example, crossing members may cross one other in a "T" shape.

Support frame 2 is preferably made of plastic and formed by an injection molding process or an extrusion process. Suitable materials for the support frame include, but are not limited to, polyethylene, polyvinyl chloride, polypropylene, polystyrene, nylon, acrylic, polycarbonate and other plastics. The support frame 2 may be constructed of a plastic reinforced with other materials such as glass fibers, carbon fibers, mica, wollastonite and talc and may comprise a binder such as an acrylic or styrene based binder.

Support frame 2 may also be made by an air or gas assisted injection-molding process. The typical process involves gas or air being injected into the hot core of the plastic melt through a nozzle, or directly into the molding cavity of the frame via one or more gas needles. Due to an almost constant pressure in all areas with gas penetration, a good and even pressure distribution and transmission is guaranteed across the molded part. After the end of the gassing phase, the pressure is released either by gas recycling or blowing the gas into the atmosphere. As soon as ambient pressure is reached, the molded frame can be ejected. Hollow pockets in the frame, created by this process, maintain flexural stiffness of the frame and, in turn, provide substantial cost savings.

It is preferable for the plastic to contain a flame retardant material such as halogenated additives/copolymers, antimony trioxide, antimony pentoxide,

nitrogen-phosphorous, phosphates, aluminum trihydrate, magnesium hydroxide, bauxite or calcium carbonate.

Alternatively, the support frame 2 and crossing members 6 and 8 may be constructed of roll-formable metals including, but not limited to, aluminum, steel, copper, tin or coated metals such as clad, galvanized, prefinished, preplated, prepainted, vinyl laminated and tin plated coated metals.

Referring now to Fig. 2, ceiling panel 12 is shown including support frame 2 including main frame 4, crossing members 6 and 8 and facing 14 which covers support frame 2. Preferably, facing 14 is a veil, textile, fabric, polymeric film, foils, laminates or other non-woven or woven facer. The facing 14 may contain glass wool or glass fibers to provide acoustical benefits to the ceiling.

In an alternative embodiment, the ceiling panel 12 may be made in one piece, including the frame and the facing material. The ceiling panel 12 is formed from a multi-layer product including an insulating layer and a structural layer, the structural layer comprising a reinforced composite. The insulating layers preferably contain a phenolic binder. The layers are laminated together via a standard compression molding process. The resulting product includes a lofted facing for insulating against the transmission of sound and heat energy and the frame, i.e., the structural layer. Preferably, the multi-layer material used is Acoustimax™ material manufactured by Owens Corning, Toledo, OH.

Referring now to Fig. 3, a side view of the support frame 16 and facing 18 is shown. Facing 18 extends across the entire length of support frame 16 and is preferably affixed to the support frame by heat bonding. In the heat bonding process, one side of support frame 16 is heated and softened. The facing 18 is then affixed to the softened side of the support frame 16 and, upon cooling, the facing 18 is firmly adhered to the support frame 16.

Adhesives can also be used to affix the facing 18 to the support frame 16. Adhesive may be applied to either the facing 18, the support frame 16 or both.

Common adhesives include epoxy adhesives, polyurethane and hot melt adhesives.

Fig. 3 illustrates a ceiling tile having a support frame 16, which is substantially flat and can be easily fit into a suspended ceiling frame system. Fig. 4 shows an alternative support frame 20 having edges 24, 26 which can be fitted into a suspended ceiling system. Facing 28 is affixed to extending portion 28 of support frame 20.

While the invention has been described in terms of preferred embodiments, it will be understood, of course, that the invention is not limited thereto since modifications may be made by those skilled in the art, particularly in light of the foregoing teachings.